IN THE CLAIMS

Claims 1-185 and claims 218-258 have been previously canceled.

Claims 186 – 199, 208-217 and 259-290 are in this application.

Claims 186, 188 and 215 are currently amended herein.

Claims 200-207 are currently cancelled.

Claims 259-290 are new.

Claims 1-185 previously cancelled

186. (Currently amended) A complete, forced-circulation, liquid cooling system for cooling heat-generating components in an electronic system comprising:

one or more heat transfer units coupled to one or more heat-generating components for receiving cooled liquid coolant and generating heated liquid coolant by transfer of heat from the heat-generating components to the liquid coolant;

a heat exchange unit, remotely disposed from the heat transfer units and the heat-generating components, for receiving heated liquid coolant from the heat transfer units and generating cooled coolant for transportation to the heat transfer units;

a forced circulation means, remotely disposed from the heat transfer units and the heat-generating components, for forcing ~~transporton~~ transportation, at accelerated rates, of cooled liquid coolant from the heat exchange unit to the heat transfer units and of heated liquid coolant from the heat transfer units to the heat exchange unit;

a liquid coolant pathway for delivery of the cooled liquid coolant from the heat exchange unit to the heat transfer units and for delivery of the heated liquid coolant from the heat transfer units to the heat exchange unit; and

wherein the complete liquid cooling system has no component acting as a liquid coolant reservoir while the liquid cooling system is in operation.

187. (Previously submitted) The cooling system of claim 186 wherein one or more heat transfer units have an inlet for receiving cooled liquid coolant from the heat exchange unit and an outlet for receiving heated liquid coolant for transporting to the heat exchange unit, wherein the inlet is disposed below the outlet for enhancing convective circulation of the liquid coolant.

188. (Currently amended) The cooling system of claim 186 wherein the heat exchange unit has an inlet for receiving heated liquid coolant from the heat transfer units and an outlet for cooled liquid coolant for ~~transporton~~ transportation to the heat transfer units, wherein the outlet is disposed below the inlet for enhancing convective circulation of the coolant.

189. (Previously submitted) The cooling system as set forth in claim 186 wherein one or more heat transfer units is comprised of a housing having one or more surfaces partially or fully open for coupling to one or more external surfaces of one or more heat-generating components and forming cavities there with and wherein the liquid coolant transported through the cavities flows across and in direct contact with the external surfaces of the heat-generating component.

190. (Previously submitted) A data processing system having the cooling system of claim 186.

191. (Previously submitted) A telecommunications system having the cooling system of claim 186.

192. (Previously submitted) An optical device having the cooling system of claim 186.

193. (Previously submitted) A system having one or more processors and having the cooling system of claim 186.

194. (Previously submitted) A method of cooling heat-generating components in an electronic system having a complete liquid cooling system and a means for forced circulation of a liquid coolant at accelerated rates remotely located from the heat-generating components and having a transportation means for transporting the liquid coolant, the method comprising the steps of:

heating liquid coolant within one or more heat transfer units coupled to one or more heat-generating components by transferring heat from the heat-generating components to the liquid coolant thereby creating heated liquid coolant for transportation by forced circulation to a heat exchange unit remotely disposed from the heat transfer units and the heat-generating components;

receiving the heated liquid coolant from the heat transfer units at the heat exchange unit;

cooling the heated liquid coolant within the heat exchange unit, thereby creating cooled liquid coolant, for transportation to the heat transfer units;

receiving cooled coolant from the heat exchange unit at the heat transfer units; and

wherein all of the above steps are performed in the complete liquid cooling system having no component acting as a reservoir for the liquid coolant while the liquid cooling system is in operation.

195. (Previously submitted) The method of claim 194 wherein one or more heat transfer units have an inlet for receiving cooled liquid coolant from the heat exchange unit and an outlet for transporting heated liquid coolant to the heat exchange unit, the method further comprising the step of:

positioning the inlet below the outlet, for enhancing convective circulation of the liquid coolant.

196. (Previously submitted) The method of claim 194 wherein the heat exchange unit has an inlet for receiving heated liquid coolant from the heat transfer units and an outlet for transporting cooled liquid coolant to the heat transfer units, the method further comprising the step of:

positioning the inlet above the outlet, for enhancing convective circulation of the liquid coolant.

197. (Previously submitted) The method of claim 194 wherein one or more heat transfer units is comprised of a housing having one or more surfaces partially or fully open for coupling to one or more external surfaces of one or more heat-generating components and forming cavities there with and wherein the liquid coolant transported through the cavities flows across and in direct contact with the external surfaces of the heat-generating component, the method further comprising the step of:

removing heat from one or more heat-generating components into the liquid coolant by direct contact of the coolant with the heat-generating components.

198. (Previously submitted) A cooling system for cooling heat-generating components in an electronic system, the cooling system having one or more heat transfer units thermally coupled to one or more heat-generating components, forced circulation means for forcing circulation of a coolant through the cooling system; coolant pathways for transporting the coolant through the cooling system, a heat exchange unit and no component in the cooling system acting as a reservoir while the cooling system is in operation, the heat exchange unit comprising:

an input cavity for receiving heated coolant from the heat transfer units and distributing the heated coolant;

a dissipater for receiving the distributed heated coolant from the input cavity and cooling the coolant;

an output cavity for receiving the cooled coolant from the dissipater and directing the cooled coolant to the heat transfer units; and

wherein the cooling system, including the heat exchange unit, has no component acting as a reservoir while the cooling system is in operation.

199. (Previously submitted) The cooling system as set forth in claim 198 wherein the input cavity is disposed above the output cavity for enhancing convective circulation of the coolant.

Claims 200-207 are cancelled.

208. (Previously submitted) The cooling system as set forth in claim 198 wherein the dissipater further comprises a plurality of coolant pathways for transporting the heated coolant through the dissipater.

209. (Previously submitted) The cooling system as set forth in claim 208 wherein one or more of the coolant pathways includes means for creating non-laminar flow of the coolant for enhancing the transfer of heat from the coolant to the dissipater.

210. (Previously submitted) A data processing system having the cooling system of claim 198.

211. (Previously submitted) A telecommunications system having the cooling system of claim 198.

212. (Previously submitted) An optical device having the cooling system of claim 198.

213. (Previously submitted) A system having one or more processors and having the cooling system of claim 198.

214. (Previously submitted) A method of cooling heat-generating components in an electronic system having a cooling system, the cooling system having one or more heat transfer units thermally coupled to one or more heat-generating components, forced circulation means for forcing circulation of a coolant through the cooling system; coolant pathways for transporting the coolant through the cooling system, a heat exchange unit, and no component in the cooling system acting as a reservoir while the cooling system is in operation, the method comprising the steps of:

receiving heated coolant from the heat transfer units at an input cavity of the heat exchange unit and distributing the heated coolant to a dissipater;

cooling the coolant in the dissipater;

receiving the cooled coolant from the dissipater at an output cavity for directing the cooled coolant to the heat transfer units; and

wherein all of the above steps are performed in the cooling system, including the heat exchange unit, having no component acting reservoir while the cooling system is in operation.

215. (Currently amended) The method of claim 214 further comprising the step of:

positioning the input cavity above the output cavity for enhancing convective circulation of the coolant.

216. (Previously submitted) The method of claim 214 wherein at least one of the heat transfer units is comprised of a housing having one or more surfaces partially or fully open for coupling to one or more external surfaces of the heat-generating components and forming cavities there with and wherein the coolant transported through the cavities flows across and in direct contact with the external surfaces of the heat-generating component, the method further comprising the step of:

removing heat from one or more heat-generating components into the coolant by direct contact of the coolant with the heat-generating components.

217. (Previously submitted) The method of claim 214 wherein one or more of the heat transfer units further comprises an inlet for receiving cooled coolant from the heat exchange unit and an outlet for

receiving heated coolant for transfer to the heat exchange unit, the method further comprising the step of:

positioning the inlet below the outlet, for enhancing convective circulation of the coolant.

Claims 218-258 have been previously canceled.

259. (New) A complete, forced-circulation, liquid cooling system for cooling heat-generating components in an electronic system comprising:

one or more heat transfer units coupled to one or more heat-generating components for receiving cooled liquid coolant and generating heated liquid coolant by transfer of heat from the heat-generating components to the liquid coolant;

a heat exchange unit having a heat dissipater for receiving heated liquid coolant from the heat transfer units and generating cooled coolant for transportation to the heat transfer units;

a forced circulation means disposed within the heat exchange unit in proximity to the dissipater for forcing transportation, at accelerated rates, of cooled liquid coolant from the heat exchange unit to the heat transfer units and of heated liquid coolant from the heat transfer units to the heat exchange unit;

a liquid coolant pathway for delivery of the cooled liquid coolant from the heat exchange unit to the heat transfer units and for delivery of the heated liquid coolant from the heat transfer units to the heat exchange unit; and

wherein the complete liquid cooling system has no component acting as a liquid coolant reservoir while the liquid cooling system is in operation.

260. (New) The cooling system of claim 259 wherein one or more heat transfer units have an inlet for receiving cooled liquid coolant from the heat exchange unit and an outlet for receiving heated liquid coolant for transporting to the heat exchange unit, wherein the inlet is disposed below the outlet for enhancing convective circulation of the liquid coolant.

261. (New) The cooling system of claim 259 wherein the heat exchange unit has an inlet for receiving heated liquid coolant from the heat transfer units and an outlet for cooled liquid coolant for transportation to the heat transfer units, wherein the outlet is disposed below the inlet for enhancing convective circulation of the liquid coolant.

262. (New) The cooling system as set forth in claim 259 wherein one or more heat transfer units is comprised of a housing having one or more surfaces partially or fully open for coupling to one or more external surfaces of one or more heat-generating components and forming cavities there with and wherein the liquid coolant transported through the cavities flows across and in direct contact with the external surfaces of the heat-generating component.

263. (New) A data processing system having the cooling system of claim 259.

264. (New) A telecommunications system having the cooling system of claim 259.

265. (New) An optical device having the cooling system of claim 259.

266. (New) A system having one or more processors and having the cooling system of claim 259.

267. (New) A method of cooling heat-generating components in an electronic system having a complete liquid cooling system, and a means for forced circulation of a liquid coolant at accelerated rates disposed in proximity to a dissipater within a heat exchange unit, and having a transportation means for transporting the liquid coolant, the method comprising the steps of:

heating liquid coolant within one or more heat transfer units coupled to one or more heat-generating components by transferring heat from the heat-generating components to the liquid coolant thereby creating heated liquid coolant for transportation by forced circulation to the heat exchange unit;

receiving the heated liquid coolant from the heat transfer units at the heat exchange unit;

cooling the heated liquid coolant within the heat exchange unit, thereby creating cooled liquid coolant, for transportation to the heat transfer units;

receiving cooled coolant from the heat exchange unit at the heat transfer units; and

wherein all of the above steps are performed in the complete liquid cooling system having no component acting as a reservoir for the liquid coolant while the liquid cooling system is in operation.

268. (New) The method of claim 267 wherein one or more heat transfer units have an inlet for receiving cooled liquid coolant from the heat exchange unit and an outlet for transporting heated liquid coolant to the heat exchange unit, the method further comprising the step of:

positioning the inlet below the outlet, for enhancing convective circulation of the liquid coolant.

269. (New) The method of claim 267 wherein the heat exchange unit has an inlet for receiving heated liquid coolant from the heat transfer units and an outlet for transporting cooled liquid coolant to the heat transfer units, the method further comprising the step of:

positioning the inlet above the outlet, for enhancing convective circulation of the liquid coolant.

270. (New) The method of claim 267 wherein one or more heat transfer units is comprised of a housing having one or more surfaces partially or fully open for coupling to one or more external surfaces of one or more heat-generating components and forming cavities there with and wherein the

liquid coolant transported through the cavities flows across and in direct contact with the external surfaces of the heat-generating component, the method further comprising the step of:

removing heat from one or more heat-generating components into the liquid coolant by direct contact of the coolant with the heat-generating components.

271. (New) A cooling system for cooling heat-generating components in an electronic system, the cooling system having one or more heat transfer units thermally coupled to one or more heat-generating components, coolant pathways for transporting a coolant through the cooling system, a heat exchange unit and no component in the cooling system acting as a reservoir while the cooling system is in operation, the heat exchange unit comprising:

an input cavity for receiving heated coolant from the heat transfer units and distributing the heated coolant;

a dissipater for receiving the distributed heated coolant from the input cavity and cooling the coolant;

an output cavity for receiving the cooled coolant from the dissipater and directing the cooled coolant to the heat transfer units; and

a forced circulation means disposed in the heat exchange unit for forcing circulation of the coolant through the cooling system; and

wherein the cooling system, including the heat exchange unit, has no component acting as a reservoir while the cooling system is in operation.

272. (New) The cooling system as set forth in claim 271 wherein the input cavity is disposed above the output cavity for enhancing convective circulation of the coolant.

273. (New) The cooling system as set forth in claim 271 wherein the force circulation means is a pump is disposed in the heat exchange unit.

274. (New) The cooling system as set forth in claim 273 wherein the pump is a self-priming pump.

275. (New) The cooling system as set forth in claim 273 wherein the pump is disposed in the output cavity.

276. (New) The cooling system as set forth in claim 275 wherein the pump includes an impeller disposed horizontally at the very bottom of the output cavity.

277. (New) The cooling system as set forth in claim 273 wherein the pump includes an impeller disposed horizontally at the very bottom of the heat exchange unit.

278. (New) The cooling system as set forth in claim 276 wherein the impeller includes one or more blades with slanted surfaces inverted so as to improve the flow of coolant out of the heat exchange unit at the bottom there of.

279. (New) The cooling system as set forth in claim 273 wherein the pump includes an impeller, the heat exchange unit further comprising:

a motor; and

a shaft coupled to the motor and to the impeller for operating the pump.

280. (New) The cooling system as set forth in claim 279 wherein no seal is required for the pump.

281. (New) The cooling system as set forth in claim 271 wherein the dissipater further comprises a plurality of coolant pathways for transporting the heated coolant through the dissipater.

282. (New) The cooling system as set forth in claim 281 wherein one or more of the coolant pathways includes means for creating non-laminar flow of the coolant for enhancing the transfer of heat from the coolant to the dissipater.

283. (New) A data processing system having the cooling system of claim 271.

284. (New) A telecommunications system having the cooling system of claim 271.

285. (New) An optical device having the cooling system of claim 271.

286. (New) A system having one or more processors and having the cooling system of claim 271.

287. (New) A method of cooling heat-generating components in an electronic system having a cooling system, the cooling system having one or more heat transfer units thermally coupled to one or more heat-generating components, a heat exchange unit, forced circulation means disposed in the heat exchange unit for forcing circulation of a coolant through the cooling system; coolant pathways for transporting the coolant through the cooling system, and no component in the cooling system acting as a reservoir while the cooling system is in operation, the method comprising the steps of:

receiving heated coolant from the heat transfer units at an input cavity of the heat exchange unit and distributing the heated coolant to a dissipater;

cooling the coolant in the dissipater;

receiving the cooled coolant from the dissipater at an output cavity for directing the cooled coolant to the heat transfer units; and

wherein all of the above steps are performed in the cooling system, including the heat exchange unit, having no component acting reservoir while the cooling system is in operation.

288. (New) The method of claim 287 further comprising the step of:

positioning the input cavity above the output cavity for enhancing convective circulation of the coolant.

289. (New) The method of claim 287 wherein at least one of the heat transfer units is comprised of a housing having one or more surfaces partially or fully open for coupling to one or more external surfaces of the heat-generating components and forming cavities there with and wherein the coolant transported through the cavities flows across and in direct contact with the external surfaces of the heat-generating component, the method further comprising the step of:

removing heat from one or more heat-generating components into the coolant by direct contact of the coolant with the heat-generating components.

290. (New) The method of claim 287 wherein one or more of the heat transfer units further comprises an inlet for receiving cooled coolant from the heat exchange unit and an outlet for receiving heated coolant for transfer to the heat exchange unit, the method further comprising the step of:

positioning the inlet below the outlet, for enhancing convective circulation of the coolant.